Chapter 3 Incorporated Freeway Management System Infrastructure Components

A full FMS project may be implemented either as a *stand-alone* project along an existing section of freeway where no civil improvements are involved or as an *integrated* project with civil improvements, typically a mainline widening. Regardless of stand-alone or integrated status, the design of the full FMS most likely involves every chapter of this guideline. The FMS infrastructure includes the following field elements, with the design of each addressed later within this guideline:

- Communications trunkline conduit system – Chapter 4;
- Detection system – Chapter 5;
- Ramp meter and other FMS cabinets – Chapter 6;
- Dynamic message signs (DMS) – Chapter 7;
- Closed-circuit television (CCTV) cameras – Chapter 8;
- Communication Nodes and Node Buildings – Chapter 9; and
- Fiber-optic Cable Outside Plant (OSP) Design and Modeling – Chapter 10.

In many instances the proposed FMS infrastructure, whether in a roadway project or in a stand-alone project, will border a local jurisdiction. The FMS designer should invite the local jurisdictions to the project kickoff meeting and coordination with the local jurisdictions should be a standard item on the progress meeting agenda. It will be the FMS designer's responsibility to coordinate with the local jurisdiction and the ADOT IGA/JPA office shortly after receiving the notice to proceed.

All submittals shall include PS&E for distribution by the designer. Regular progress meetings as well as comment resolution meetings shall be held for each project. The designer must submit estimates in the ADOT E2C2 format and provide a schedule detailing the 21 milestones tracked by ADOT. Requests for utility service drops are typically the responsibility of the designer and will require on-site meetings with the utility company providing service.

This section outlines basic designer responsibility and is intended for information, but it is not all-inclusive.

3.1 FMS Infrastructure with a Roadway Project

The FMS infrastructure elements shall be considered an integral part of the freeway design. As a minimum in each project, the designer should include trunkline conduits, pull boxes, and detection systems. These elements are placed below ground or in the pavement and as such should be constructed with the freeway or freeway widening. This constitutes the "plumbing" of the FMS system.

The trunkline conduit system extends along the mainline freeway corridor and provides the primary method of distributing fiber-optic communications cabling and power conductors for the system. The conduit system also includes pull boxes placed along the mainline conduit system.

The pull boxes are required to interconnect the field devices with the communications and power cables, and to facilitate installation and maintenance of the FMS.

Where new pavement is to be installed, preformed loop detectors are required to be placed beneath the pavement section. In this case loops are placed along the freeway mainline and on entrance ramps.

In some instances, other elements of the FMS design, such as ramp meters, cabinet foundations, DMS foundations, CCTV foundations, controller cabinet platforms, or special conduit connections must also be provided within the roadway design. These additional FMS elements are required when elements of the roadway design (such as retaining walls, sound walls, long bridges, median barrier, etc.) make it impractical or excessively costly to complete the necessary installation during a future FMS implementation project. Blisters for DMS signs, pull box locations, and lateral crossings of the freeway should be strategically placed to accommodate future devices. The designer should consider the criteria presented in this guideline for placement of the infrastructure.

In many instances the FMS designers in large-scale roadway projects are required to attend the overall project progress meetings. Although these progress meetings are very productive, the FMS portion of the meeting is small compared to the overall project components. These meetings can also be very time consuming and in many instances the ADOT TTG staff cannot set aside a block of time to attend the entire meeting. The FMS designer will need to set up a separate progress review meeting with ADOT TTG, ADOT Phoenix Construction District ITS and/or local construction district, and ADOT VISION field office staff after each project submittal. It will be the responsibility of the FMS designer to set up these progress meetings.

3.2 FMS Infrastructure Stand-Alone Projects

When FMS infrastructure is designed as a stand-alone project, the designer bears a greater responsibility for planning documents, clearances, and conformance to the ADOT project management process. Coordination with other agencies and local utilities is the responsibility of the designer.

The designer typically starts with a planning document such as a PA that takes the project to 30% design including an estimate and discussion of design alternatives considered. The document will show preliminary device locations in sketch format and identify any special considerations, such as local agency involvement, special clearances needed, and special geographic concerns. The document should include a general project schedule for design and construction. Base mapping is generally not required at this stage.

Clearances required included environmental, utility, and right-of-way. Where projects occur on Native American lands, special permits may need to be obtained. Special permits or clearances may also be needed for railroad, state parks, flood control districts, and connections to city facilities. The designer must be aware of these items and budget for them in the schedule. A JPA or IGA may be needed to reimburse costs for enhancements desired by outside agencies and/or shared communications infrastructure (i.e., conduit and fiber-optic cabling systems).

Prior to the kickoff meeting, the designer should meet with the ADOT TTG PM to discuss stakeholders, statements of work, schedule, scope, and budget. Traffic control will typically be the responsibility of the designer including traffic control for bucket truck surveys and field surveys. Special field surveys will be

needed for specific devices such as DMS, CCTV, detection systems, and Node buildings. Where unique structural designs are required, the designer must involve the ADOT Structures Group.

ADOT Phoenix Construction District ITS and ADOT VISION Field Office play an important part in plan and specification review. Their input was extensive in the production of these guidelines and must be included for each project designed.

The designer should plan on conducting a post design meeting with the VISION Field Office to present the project to the construction inspectors. In addition, the designers' continued involvement through construction as part of post design services is desired. Developing as-builts and providing a final computer aided design disc after construction is also a design responsibility.

3.3 Emerging Technology

Other technologies for FMS infrastructure may be considered in the design provided they have been approved by the ADOT TTG. A listing of current ADOT approved technologies appears on the *Approved Products List* (*APL)* following the *Product Resource Investment Deployment and Evaluation* (*PRIDE)* process. The PRIDE process is administered by the ADOT Transportation Planning Division's *Arizona Transportation Research Center*. Due to the technological nature of FMS, research projects can be proposed by designers for inclusion in current project plans.

PAGE INTENTIONALLY LEFT BLANK